This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
J151 .M82 1879
The microcosm of disease : an address in
STOR
24503314259

THE

MICROCOSM OF DISEASE:

AN ADDRESS

INTRODUCTORY TO THE SESSION 1879–80,

DELIVERED IN THE

THEATRE OF THE MEATH HOSPITAL,

ON MONDAY, NOVEMBER 3rd, 1879.

BY

JOHN WILLIAM MOORE, M.D., UNIV. DUB.;

FELLOW AND EXAMINER OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS;
ONE OF THE PHYSICIANS TO THE HOSPITAL;
PHYSICIAN TO CORK-STREET (FEVER) HOSPITAL, DUBLIN;
LECTURER ON PRACTICE OF MEDICINE AT THE CARMICHAEL COLLEGE OF MEDICINE AND SURGERY;
EXAMINER IN MATERIA MEDICA IN THE QUEEN'S UNIVERSITY IN IRELAND;
DIPLOMATE IN STATE MEDICINE AND EX-SCHOLAR OF TRINITY COLLEGE, DUBLIN.

J151
M82
1879

DUBLIN:
PRINTED FOR THE AUTHOR
BY JOHN FALCONER 53, UPPER SACKVILLE-STREET.

1879.

LANE

MEDICAL LIBRARY

LEVI COOPER LANE FUND

THE MICROCOSM OF DISEASE:

AN ADDRESS

INTRODUCTORY TO THE SESSION 1879–80,

DELIVERED IN THE

THEATRE OF THE MEATH HOSPITAL,

ON MONDAY, NOVEMBER 3rd, 1879.

BY

JOHN WILLIAM MOORE, M.D., UNIV. DUB.;

FELLOW AND EXAMINER OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS;

ONE OF THE PHYSICIANS TO THE HOSPITAL;

PHYSICIAN TO CORK-STREET (FEVER) HOSPITAL, DUBLIN;

LECTURER ON PRACTICE OF MEDICINE AT THE CARMICHAEL COLLEGE OF MEDICINE AND SURGERY;

EXAMINER IN MATERIA MEDICA IN THE QUEEN'S UNIVERSITY IN IRELAND;

DIPLOMATE IN STATE MEDICINE AND EX-SCHOLAR OF TRINITY COLLEGE, DUBLIN.

DUBLIN:

PRINTED FOR THE AUTHOR

BY JOHN FALCONER 53, UPPER SACKVILLE-STREET.

1879.

45

THIS PAGE INTENTIONALLY LEFT BLANK

M82
1879

INAUGURAL ADDRESS.

GENTLEMEN,

Once more we stand upon the threshold of a medical session—the one hundred and twenty-ninth in the history of the Meath Hospital. In accordance with old-established custom, it becomes my duty to deliver our Inaugural Address this day. As you well know, this Institution is justly celebrated for the services rendered within its walls, through a long series of years, to the sick and dying; nor is it less renowned as the school in which many generations of physicians and surgeons have been trained to a life of self-denial and of active benevolence, for these are the qualities which must pre-eminently characterise every good and true-hearted disciple of Æsculapius.

Very pleasant it is for me, as I stand here, to gaze upon the well-known faces of those senior students who, in past sessions, with my colleagues and myself, have studied at the bedside of the sick—have laboured by day, and not seldom by night, to soothe pain, or check the ravages of disease, and have endeavoured, even in some slight degree, to cheer the faint-hearted and downcast in the time of their weakness or distress. Your presence, gentlemen, as senior members of the hospital class, is a great encouragement on an occasion like this, and nerves me to what perchance would otherwise prove an overwhelming task.

But in this theatre to-day I see many a face, as yet unfamiliar to me, but all aglow with expectant enthusiasm; and it would be most ungenerous on my part did I not welcome—aye, and that, too, with a "cead mille failtha"—that noble band of volunteer recruits who, by their presence here, declare that they would fain equip themselves for the conflict, and in due time take their place in those serried ranks of trained veterans who have already marched onward into the forefront of the battle with disease and death.

84076

Yes, the life of the physician is a warfare; and as in a struggle between nation and nation many a gallant soldier falls or ever the conflict is over and the victory won, so in the warfare of which we now speak ever and anon a champion bites the dust, struck down in the middle of the fray. Not many months ago this was the fate of one of our leaders. On the morning of Easter Day, April 13, 1879, Mr. Robert Perssé White, one of the surgeons to this hospital, passed from the scene of his earthly labours at the comparatively early age of forty-eight years. He had been in bad health for more than a year, but his fatal illness lasted only a few days, and in the end his death was somewhat sudden. Although Mr. White did not contribute largely to the literature of his profession, he was an able surgeon. His opinion was essentially sound, and as an operator he was possessed of much dexterity and skill. In 1852 Mr. White became a Licentiate of the Royal College of Surgeons in Ireland, to the Fellowship of which body he proceeded in 1857. He also joined the King and Queen's College of Physicians in Ireland as a Licentiate in the year 1860. Early in his professional life, Mr. White was elected a Surgeon to Jervis-street Hospital and Charitable Infirmary—an appointment which he resigned in 1868, on succeeding the late Mr. James H. Stronge as one of the Surgeons to the Meath Hospital and County Dublin Infirmary. Mr. White ever took a special interest in the "Smyly Memorial Ward" for children in this hospital, and in it he might often have been seen tending the little sufferers with gentleness and skill, as though he fully realised the inestimable value of a child's life—inestimable to the parents, to the community, to the State. A special feature in Mr. White's professional character was his fatherly devotion to the interests of the students of the hospital. The painstaking, careful, clinical instruction which he gave in the wards will not easily be forgotten by old Meath Hospital men, and many a student will remember with sorrowful regret the kindly care and attention they received in time of sickness at the hands of Mr. White. Eleven years of earnest labour in the interests of the patients and of the hospital, and to our colleague came the call—"Enter into thy rest!"

Since Mr. White's death, Mr. William Joseph Hepburn has been unanimously elected by the Medical Board a surgeon to this hospital; and I am sure I only express the feeling of everyone in *this* theatre when I tender to Mr. Hepburn, on behalf of my col-

leagues and myself, a hearty welcome; and promise him, on the part of every member of the class, a loyal and kindly reception.

It is customary, on occasions like this, to address a few words of welcome to new-comers, of counsel and encouragement to those who have studied in the wards during past sessions, and who are now about to launch the barque that bears their fortunes upon the waters of life's troublous sea. On those of you who are now, for the first time, entering upon your hospital studies, I would impress the urgent necessity which exists for punctual daily attendance in the wards. It is there only that you can make yourselves familiar with the *realities* as distinguished from the *names* of disease. Be assured, mere book-knowledge of the practice of medicine and surgery will fail you in the time of need, slipping, ghost-like, from your grasp—

"Ter frustra comprensa manus effugit imago."

As a highly esteemed member of the profession, himself once a physician to this hospital—Dr. Alfred Hudson—lately said:—"It is at the bedside only that a student can be trained in the habits of observation—in the exercise of his senses of sight, hearing, and touch—in the use of those instruments of precision so necessary for the detection and diagnosis of disease—and in the proper treatment of diseases and injuries. Nor let it be supposed that this interferes with the primary object of the hospital, or with the comfort or welfare of the patients. On the contrary, in no institution are they so carefully attended as when placed under the immediate care of the students, who, moreover, acquire an interest in them, and by daily contact with them become imbued with a love for their calling—a matter of unusual importance—and with that kindliness of manner and sympathy with the suffering which happily characterise the intercourse of our most eminent professional men with their poorer patients."

But as you study disease at the bedside of the sick, never forget that the books in which you read, and from the pages of which you cull the practical knowledge of your profession, are human beings, of like feelings with yourself, sensitive, too often sorrow-stricken and cast down. Beware lest by any unkind or thoughtless word or action you add to the burden they have to bear. I am not one who would forbid the smile or even the laugh in the sick room, but take care that when you smile or laugh the patient

smiles and laughs with you. Self-denial, patience, gentleness, kindness—these are qualities of heart and life which you must cultivate day by day if you would win the confidence of those you tend. There is a wondrous healing power in the sympathetic look, the gentle touch, the soothing, cheering word. "It is commonly possible," says a writer in a recent number of the *British Medical Journal*,[a] "in any assembly of professional men to recognise the physician by a certain habit of gentle speech, of considerate and fatherly kindness, and half-condescending, affable submission to opinions which it is not his business at the moment to contradict."

The same writer continues:—"The first thing that is now required of a medical man is that he should be an educated, cultivated, and right-minded gentleman, and then that he should bring to his work the large and liberal knowledge on which alone its right performance can be based, and that he should fulfil his duties with kindness, with courtesy, and with a sense of just dignity. . . . Moving among scenes of pain, suffering, and of physical distress, the habitual witness of severe trials of the mental and moral strength of those who call him, or who consult him, it would be strange if some reflection of the influences thus brought to bear on him were not evident in the manner of the medical man. He must necessarily be softened and rendered more thoughtful—he must be more conscious of the weaknesses and of the unexpected sources of strength in the human character. . . . The best school of manner for a right-minded physician is the hospital. It is there that he comes in contact with the poorest, the most suffering, and those who may, from the very nature of their cases and their conditions, most rightfully claim his constant sympathy; and it is in the hospital and in the early days of medical practice and of medical studentship that the character is most impressed, and that the foundations of manner in after-life are laid. It is there that the student and the doctor should be on their guard to study the best and not the worst side of the humanity of which all the weaknesses are plainly laid before him—it is there that they must guard against petulance, roughness, hurry, or impatience. No one can be familiar with the casualty wards or the out-patient rooms of a hospital without being struck with the development which they afford to the better nature of the better kind of men. No one can have failed

[a] Medical Manners. Brit. Med. Jour., Oct. 11, 1879. Page 583.

to notice the self-restraint and patient kindness with which often score after score of the sick poor are treated, their stories quickly unravelled, the point of their ill-told histories detected, their pain of mind relieved, and their pain of body removed. On the other hand, it is possible sometimes to see less welcome sights, hear hasty words and impatient ejaculations, and sometimes even a rough neglect may be noticed. Against this students and doctors alike need to be on their guard."

I have every confidence that the sentinels of the Meath Hospital will to a man withstand the onslaught or the treacherous night attack of such a deadly, crafty foe, and that in the session we to-day inaugurate nothing will occur to stain or mar the reputation of this hospital as the school in which generation after generation of kind-hearted, skilful physicians and surgeons have been trained to a life of heroic devotion in the cause of a suffering humanity.

I have now to crave your indulgence, gentlemen, while I speak at some length of one of the burning questions of the day in relation to the progress of medical science. The subject is a difficult one to write about or to follow; but its great importance, as bearing on the practice of medicine and surgery, must plead with you for me if I am somewhat long, and more than somewhat tedious.

The Microcosm of Disease.

For some time past such expressions as "zymotic disease," "blood-poisoning," "germ theory of disease," "antiseptic medicine and surgery," and the like, have been on everybody's lips. It occurred to me, therefore, that it would be neither uninteresting nor uninstructive were I to give a brief summary of the present state of our knowledge respecting what may, perhaps, be termed the "Microcosm of Disease."

The Causes of Disease are, from a sanitary point of view, conveniently classified by Dr. John S. Billings, Surgeon in the United States Army,[a] into—(1) Hereditary; (2) Physical and Chemical; (3) Organised or Vital; (4) Mental or Emotional. The third class of causes—those which are known or supposed to be organised or vital in character, is the most important of all in public hygiene. To quote Dr. Billings—"Of the total sickness

[a] Introduction to Dr. Albert H. Buck's Hygiene and Public Health, page 13. New York: William Wood & Co. 1879.

and mortality of the human race, a very large proportion is due to those diseases which may become epidemic, and these are of peculiar and special interest to the sanitarian, not only because of their frequency and the magnitude of their effects, but because it is believed that they are all more or less preventable, and because such prevention requires something more than individual action. The word 'epidemic,' as used here, means general, prevalent, affecting many people in a community, and, as applied to disease, it simply indicates its relative prevalence."

Dr. Billings further observes that the most important forms of this extensive group of epidemic diseases are those which are supposed to be due to specific causes, usually spoken of as "poisons," and which are classed by German writers as the *infective* (not, *infectious*) diseases. In many of these diseases the cause can reproduce itself without limit, thus presenting one of the characteristics of a living thing or organism; and in a few of them this living organism is known, forming the class of parasitic disease. We may divide the infective diseases into four classes—

a. Parasitic Diseases.
b. Contagium Diseases.
c. Miasmatico-Contagium Diseases.
d. Miasmatic Diseases.

That the cause of each of the three first classes is specific is inferred from the fact that the disease transmitted is always the same. There is no satisfactory evidence that any of these causes arise spontaneously; in every case the pre-existence of the specific poison or infective organism seems to be necessary.

In the majority of parasitic diseases we can recognise the causal organism apart from the diseases which it produces; and, in fact, as soon as we learn clearly the nature and life-habits of an organism causing disease and its mode of propagation, whether within or without the body, we look upon that disease as belonging to the parasitic group. Very probably some of the maladies now known only as members of the "contagium" or "miasmatico-contagium" series, will one day be transferred to the parasitic class, and this probability is expressed by what is known as the "germ theory."

A moment's reflection will convince us of the eminently practical nature of the inquiry into the origin of epidemic affections, and specially of the so-called "catching" diseases. This is well put by Dr. Burdon Sanderson, who says, in the introductory remarks *to his* Report on the Intimate Pathology of Contagion, "The

question of the mode of existence of contagious matter lies at the foundation of all scientific inquiry as to the means of obviating or counteracting contagion."

At this stage of our investigations it will be well to refer briefly to the meaning of two terms, of which we shall have to say a good deal anon—*Fermentation* and *Decomposition*. In Watt's "Dictionary of Chemistry," Vol. II., page 624, 1872, we meet the following passage, which clearly explains what fermentation is:—"Certain organic compounds, when exposed to the action of air, water, and a certain temperature, undergo decomposition, consisting either in a slow combustion or oxidation by the surrounding air, or in a new arrangement of the elements of the compound in different proportions (often with the assimilation of the elements of water), and the consequent formation of new products. The former process, that of slow combustion, is called *Eremacausis*[a] or *Decay;* the latter is called *Putrefaction* or *Fermentation—putrefaction* when it is accompanied by an offensive odour, *fermentation* when no such odour is evolved, and especially if the process results in the formation of useful products; thus, the decomposition of a dead body, or of a quantity of blood or urine, is putrefaction; that of grape-juice or malt-wort, which yields alcohol, is fermentation."

It is now many years since the terms "Zymosis" and "Zymotic Diseases" were reintroduced into medical nomenclature. In the first instance, these words, which are derived from the Greek ζύμη, "leaven," were employed to denote a class of diseases, the process of development of which was regarded as analogous to the vinous fermentation. In this form of fermentation, as is well known, the introduction of the yeast plant—a microscopic fungus called *torula cerevisiæ*—into a saccharine fluid causes the conversion of the sugar contained in such a fluid into alcohol and carbonic dioxide or carbonic acid. The yeast plant itself flourishes and multiplies provided it meets with a suitable soil, containing nitrogenous elements to supply it with nutriment. Now, in certain diseases there is good reason to believe that minute living bodies or organisms—called "microzymes" by Dr. Burdon Sanderson, "microdemes" by Dr. Billings, and less accurately "bacteria" by many writers—if introduced into the blood are capable, *under certain circumstances*, of inducing a process of fermentation, accompanied by the formation of a poison or virus, which in turn produces in

[a] ἥρεμα, "by degrees;" κάυσις, "a burning."

each disease a special train of symptoms. There are cases, also, in which these microdemes set agoing a fermentation *outside* the body, as in *septicæmia* or *septic infection*, the result being the production of a poison—*sepsin*—which, if introduced into the blood, causes symptoms in proportion to the dose, for the septic poison is found to be incapable of self-multiplication. M. Pasteur applies the name "*Zymiques*," or "*Anaërobies*," to those organisms which act as ferments only when the air is excluded—those which require the presence of air to induce their action being distinguished as "*Azymiques*," or "*Aërobies*."

At the present day, however, the term "zymotic" is used in Dr. William Farr's Nosology in a much wider sense. It is almost synonymous with the term "Epidemic Diseases," as already defined, and is used to denote all the principal diseases which have prevailed as *epidemics* or *endemics*, and all those which are *communicable* either by human contact or by animals in a state of disease, as well as the maladies which result from the *scarcity and the deterioration of the necessary kinds of food*, or from *parasitic animals*. The diseases of the zymotic class thus arrange themselves into the four orders of *Miasmatic*, *Enthetic*, *Dietic*, *and Parasitic* disorders, of which *Fever*, *Syphilis*, *Scurvy*, and *Worms* may be regarded as the types.

The topics which we have now to consider in some detail are:—

I. The microphytes of the blood and their relation to disease.
II. The nature of the virus in the Contagium Diseases.
III. The practical bearing of the subject.

I.—The Microphytes of the Blood and their Relation to Disease.

Of late years the attention of thoughtful and scientific members of the medical profession has been repeatedly drawn to the possible connexion between diseased states and the presence of microscopic organisms or microphytes in the blood. In the first part of a Memoir on the Microzoa and Microphytes of the Blood,[a] Dr. T. Richards Lewis writes—"The forms of plant-life which have been recognised as having been more or less closely associated with changes in living animal substances are the lower kinds of fungi.

[a] Appendix to the Fourteenth Annual Report of the Sanitary Commissioners with the Government of India. Reprinted in the Quarterly Journal of Microscopical *Science, July, 1879, p. 356, et seq.*

These Nägeli[a] separates into three groups: (1) *Moulds*, characterised by branched, segmented, or unsegmented filaments; (2) *Sprouting Fungi*, yeast cells of various kinds, consisting of more or less oval corpuscles, which multiply by means of sprouts from their surfaces; and (3) *Cleft-fungi* or *Schizomycetes*, minute spherical or oval bodies, which are multiplied by fission only, and which sometimes remain isolated, at others form unbranched rows (rods, threads, &c.), but only occasionally present a cubiform aspect. To this group the *bacterium, vibrio, vibrio-bacillus, spirillum*, &c., belong."

It is only the various forms of the third of these groups—the *cleft* or *fission-fungi* (*Schizomycetes*, of Nägeli, from σχίζω, "I cleave," and μύκης, "a mushroom," or "fungus;" *Schizophyta*, of Cohn of Breslau)—which have, up to the present, been unequivocally found in the blood. The recognised forms of cleft-fungi are: (1) *Spherical Bacteria*, minute vitalised bodies, barely visible with the highest microscopical powers (Fig. 1, A); (2) *Elongated Bacteria*, almost equally minute cylindrical rods (Fig. 1, B); (3) *Vibriones*, short, undulating filaments manifesting somewhat screw-like movements (Fig. 1, C); (4) *Bacilli* or *Vibrio-bacilli*, fine, short filaments, indistinctly jointed, which, when they attain considerable length, are sometimes described as *leptothrix* filaments (Fig. 1, D); (5) *Spirilla*, fine, more or less flexible, spiral filaments, which manifest well-marked screw-like movements (Fig. 1, E)—Lewis.

Fig. 1.

Various forms of Cleft or Fission-Fungi (*Schizomycetes*). A, Spherical Bacteria (*Bacterium punctum*); B, Elongated Bacteria (*Bacterium termo*); C, Vibriones; D, Bacilli; E, Spirilla. × 600 diam. [After Lewis.]

Examples of each of these forms of cleft-fungi may commonly be detected in the ordinary muco-saliva from the mouth of healthy

[a] Die niederen Pilze in ihren Beziehungen zu den Infectionskrankheiten und der Gesundheitspflege. München. 1877.

persons, but they are either absent from the blood in health, or if they enter the *liquor sanguinis*, through the lungs, or from the intestinal mucous membrane, they speedily disappear, should the plasma of the blood be healthy. In certain diseased conditions, however, microphytes are generally, though perhaps not always, present in the blood. At the same time, in cases where they are found, no direct connection seems to exist between their number and the gravity of the malady.

It has been clearly established that one or more of the forms of cleft-fungi have been found in the blood in two diseases—viz., *malignant pustule* and *relapsing fever*. M. Pasteur has recently maintained that a third should be added to the list—*septicæmia;* and, still more recently, a fourth has been added by Dr. Klein—namely, the disease commonly known as "*typhoid fever*" of the pig.[a] With this class of diseases also, some authors, such as Oertel, Klebs, and others, would rank *diphtheria*, and quite lately *malaria* has taken its place among the microphytic affections, as have also *noma*—or *cancrum oris*—and *autumnal diarrhœa*.

SPLENIC FEVER.

(1.) In the blood and fluids of animals and men affected with Malignant Pustule, or, to use a more scientific name, Splenic Fever, the *Milzbrand* of the Germans, the *Charbon* or *Mal de Rate* of the French, are commonly found peculiar organisms termed *bacteridia* by Davaine, whose researches first drew serious attention to the subject. In 1875 Professor Ferdinand Cohn published the result of his examinations of these organisms, and having pronounced them to be *bacilli*, suggested that they should bear the name *Bacillus anthracis*. A great difficulty had long before arisen in connexion with this theory of the origin of splenic fever. It was observed that although the contagious properties of the blood of affected animals soon disappeared, yet the contagion of the disease seemed to cling with great tenacity to certain limited localities, as, for instance, to a particular stable, where it would reappear after long intervals—sometimes three or four years. This difficulty threatened to prove fatal to the theory of the microphytic origin of splenic fever; but in 1876 Dr. Koch, of Wollstein (Posen), announced his ability to demonstrate the existence of *resting spores* of the *bacillus anthracis*, which had the power of retaining their

[a] Lewis, loc. cit. P. 361.

vitality for a long time—at least four years, and of giving rise to a new generation of bacteridia. This afforded a ready and satisfactory explanation of the peculiar localised persistence of the contagium of splenic fever. Nor is there anything more wonderful in the existence of these resting spores of disease than is commonly observed in seeds, in animal ova, and in roots. "Thus," says Dr. Graves,[a] "the curious fact has been observed of a bulbous root, taken from the hand of an Egyptian mummy, having germinated when placed in the soil. How happened it that this bulb remained for several thousand years in contact with the fingers of death, without its own vital principle being either extinguished or called into active operation? What power at once preserved that principle and held it in abeyance? And yet so it was. And age after age passed away without summoning into action that wondrous spell which could thus convert this long-enduring tenant of the tomb into the lily of the field, the Scriptural emblem of beauty, and the honoured type of the glories of vegetable life, beside the purity and brightness of whose hues even the raiment of Solomon appeared dull and faded."

MALARIA.

(2.) In 1866 Salisbury published a paper in the *American Journal of Medical Sciences*, in which he endeavoured to show that the poison of Malaria consisted of the spores of *Palmella*, a species of alga. He was, no doubt, wrong in regarding the malarious poison as a palmella, but he may have been right in looking upon it as a kind of alga. In 1875 some researches were made by M. Lanzi and G. Terrigi, which led them to look upon the poison of malaria as of vegetable origin. In the spring of the present year (1879) Professor Klebs and Signor Tommasi-Crudeli instituted a series of beautiful experiments, which have proved to their satisfaction that certain organisms belonging to the genus *Bacillus* are the true cause of malaria. These organisms, which they propose to call *Bacilli malariæ*, since they have seen them develop within the bodies of animals infected by malaria, are to be found in the infective liquids obtained by the earth from the air, and by cultivation as in the bodies of infected animals. In the soil of malarious regions they are found in the form of numerous spores, which have the power of independent motion, and strongly refract the light. These spores develop into long filaments, which are at

[a] Studies in Physiology and Medicine. London: J. Churchill & Sons. 1863. P. 211.

first homogeneous, but subsequently undergo transverse fission, which converts them into a chain. In the interior of each link of this chain new spores then develop.

The greatest development of the *Bacillus malariæ* in the bodies of infected animals occurs in the spleen and medulla of the bones. This fact is noteworthy, since it is precisely in these organs that the most characteristic anatomical alterations are to be found, in consequence of grave malarious fevers in man.

TYPHOID FEVER OF THE PIG.

(3.) In February, 1878, Dr. E. Klein, F.R.S., brought before the Royal Society a portion of the result of an experimental inquiry (which had been conducted for the Medical Officer of the Local Government Board) into the etiology of a disease sometimes described as "Typhoid Fever of the Pig," also as "Hog Plague," "*Mal rouge*," "Red Soldier," and "Malignant Erysipelas." Dr. Klein, however, proposes to show that the disease is not typhoid fever, nor yet anthrax, but an infectious disease of its own kind, which he proposes to call "Infectious pneumo-enteritis" of the pig (*Pneumo-enteritis Contagiosa*).[a] In this disease the peritoneal exudation always contains the virus in an active state, whereas the fresh blood as a rule neither contains any foreign matter nor possesses any infectious property. Dr. Klein, as the result of seven cultivation experiments performed by him, concludes that the virus can be cultivated artificially—*i.e.*, outside the body of the animal. He states that the cultivated liquids proved, on microscopical examination, to be "the seat of the growth and development of a kind of bacterium which has all the characters of *Bacillus subtilis* (Cohn)." The fine (hence the qualifying affix *subtilis*) rods or filaments of this bacillus under favourable circumstances grow into leptothrix-like filaments just as other bacilli are known to do. "In these filaments," writes Dr. Klein, "highly refractive spores make their appearance. These become free after the disintegration of the original filamentous matrix." Dr. Klein concludes his paper thus:—"Seeing that splenic fever, pneumo-enteritis, and specific septicæmia possess a great affinity in anatomical respects, and seeing that in splenic fever and pneumo-enteritis there is a definite species of

[a] Experimental Contributions to the Etiology of Infectious Diseases, with special reference to the Doctrine of Contagium Vivum. Quarterly Journal of Microscopical Science. April, 1878. P. 170.

bacillus—the difference of species being sufficiently great to account for the differences in the two diseases—we may with some probability expect that also the third of the group—viz., specific septicæmia, is due to a *bacillus*. This, however, remains to be demonstrated."

SEPTICÆMIA.

(4.) As Dr. Billings well observes,[a] Septicæmia, "Blood-poisoning," or, as it is more accurately called, "Septic Infection," is a disease of great importance, in part because it occurs everywhere and at all times, constituting an ever-present danger, especially in surgical and puerperal cases; in part because we have now good reason to believe that it can be prevented in the great majority of instances. The disease seems due to a poison or virus produced by microphytes, but in which the elaboration of the poison does not occur, at least does not usually occur, within the body. The symptoms are therefore generally proportionate to the dose of the poison received into the system. Septicæmia is defined by Dr. Burdon Sanderson to be "a constitutional disorder of limited duration, produced by the entrance into the blood-stream of a certain quantity of septic material."

"This septic poison," writes Dr. Billings, "may be separated from putrefying material by chemical processes, and obtained in the form of a transparent fluid. This fluid contains no germs in the sense that a germ is that which produces an organism, but it does contain a specific, virulent something, which can be separated from it by a porcelain filter, and which does not multiply and reproduce itself. The 'sepsin' is not then the cause, but the result, of putrefaction, and when introduced into the living body its effects are in proportion to the quantity introduced, like those of a chemical poison."

In an important paper,[b] submitted to the French Académie des Sciences in 1877, MM. Pasteur and Joubert gave a histological account of the *vibrions de putréfaction*, mobile organisms of the cleft-fungi group, which are now regarded as the ferment in the elaboration of the septic poison. In all cases of septic infection, in addition to the growth of microphytes—the "vibrions de putréfaction"—and the elaboration of their specific product, *sepsin*, whether without or within the body, it is necessary to the pro-

[a] Loc. cit. P. 24.

[b] Comptes Rendus. Tome LXXXV., p. 101. July 16, 1877.

duction of the septic symptoms that the condition of the tissues and vessels shall be such as to permit the entrance of the septic poison into the blood. We shall presently have to return to this subject.

DIPHTHERIA.

(5.) In a paper on the "Specific Origin of Diphtheria,"* Drs. Cossar Ewart and Malcolm Simpson, having alluded to the investigations of Oertel and Klebs and others, put forward the view that this deadly disease is, in all probability, set up by a specific organism which exists in the form of solid particles suspended in certain atmospheres. These particles exist as exceedingly minute spores, scarcely larger than the smallest forms of micrococci, but capable of germinating into long excessively fine bacilli whenever they reach a suitable medium or soil, such as is provided for them on the surface of the tonsils, soft palate, or pharynx, when from any cause the superficial epithelial cells, or the cells surrounding or lining the mucous glands, have undergone partial destruction. When the spores reach the surface of a mucous membrane in this condition, they at once germinate into bacilli, which, by transverse fission, rapidly increase and penetrate the epithelial layer at least as far as the rete Malpighii. While this is going on, partly as the result of the irritation set up, the lymph spaces in the mucous and submucous layers are greatly distended, the vascular supply is thus cut off, and the whole tissue is destroyed—in other words, converted into a diphtheritic or false membrane. Besides these local changes, constitutional symptoms supervene, which resemble in many ways the symptoms of blood-poisoning, and probably result from the absorption of a virus formed during the growth and development of the organisms. The life-history of the bacillus of diphtheria is the same as that of the *bacillus anthracis;* but when the spores were applied to a raw surface, instead of setting up splenic fever, they rapidly led to the formation of a diphtheritic membrane.

RELAPSING FEVER.

(6.) In the diseases we have been considering, the microphytes or microdemes belong to the bacillus species of the cleft-fungi. To Relapsing or Recurrent Fever, another species, the spirillum, seems

* Brit. Med. Jour., Sept. 7, 1878, page 367.

so intimately and constantly related that the disease is now coming to be known as "Spirillum Fever." Under this title Dr. H. Vandyke Carter lately described an epidemic which prevailed at Bombay in 1877.[a] At the beginning of 1873 the late Dr. Obermeier, of Berlin, first drew attention to the occurrence in the blood of patients suffering from relapsing fever of peculiar vibrio-like bodies, which closely resembled the *Spirillum* (*Spirochæte*) *plicatile* which had been found by Ehrenberg in water many years ago. Dr. Carter thus describes this fission-fungus, which is now generally known as the *Spirillum Obermeieri*:—

"Its ordinary aspect is that of a colourless, homogeneous, and very delicate, spirally-twisted filament, which, during life, is in constant motion amidst the *liquor sanguinis;* the length varies from $\frac{1}{1500}$th inch to $\frac{1}{300}$th inch; its breadth is immeasurably slender, or probably not more than the $\frac{1}{40000}$th to the $\frac{1}{30000}$th inch. The spiral or corkscrew twist is regular and best seen when the organism is quiescent or after its death, whilst during active movement (especially the lashing side movements) it becomes undone and may almost disappear—the filament meantime gaining in apparent length. The motion of the spirillum, though continuous, is transiently intermittent and not constantly in the same direction; it is compounded of a rotation on the long axis—which is the most characteristic—a lateral or lashing movement, and a progression forwards or backwards; all these actions may be so rapidly performed as to puzzle the eye of the observer, who sees only swarming or shooting non-defined bodies traversing the field of the microscope."

Dr. Carter states that the number of spirillar bodies in the blood of a patient suffering from this specific fever is simply immense, and often incalculable except by hundreds of millions. Dozens may be seen in the field of the microscope at one time, troubles of the circulation being clearly enough indicated in the patient's dusky and harassed visage; on the other hand, the spirilla may be rare, and to be found only after very patient search. Doubtless a relationship obtains between the abundance of the parasite and the intensity of the fever, but it is a contingent one, for Dr. Carter has observed the spirillum to be tolerably numerous during collapse (temp. 95° F.) and at ordinary temperatures, while a rise in heat when considerable (105° to 106°) may be attended with a positive diminution in the

[a] Notes on the Spirillum Fever of Bombay, 1877. Medico-Chirurgical Transactions. Vol. LXI., page 273. 1878.

numbers of the organisms, and is consistent with their entire disappearance. Commonly, however, pyrexia and parasite are in closest relationship at particular times.

CANCRUM ORIS.

(7.) Noma, or Cancrum Oris, would seem to be one of the diseases in which organisms are often present in the fluids of the body. Dr. A. E. Sansom has recently published in the *Medico-Chirurgical Transactions*[a] a case of noma in which moving bodies were observed in the blood during life. They were small, highly-refractile bodies endowed with powers of rapid locomotion. On account of such motion the exact shape of these bodies was difficult to determine, but, when comparatively still and a little out of focus, each one refracted light in such a manner that a small bright cross was visible in its surface. Thus they resembled crystals of oxalate of lime, with the exception that they were not perfect octahedra, but appeared as fragmentary crystalloids.

The movement of these bodies resembled that of very minute bacteria. It was lineal and sometimes opposed a current in the fluid; thus, two or three which were observed to be attached to a red blood-corpuscle were seen to move the corpuscle in a direction opposite to that in which many other corpuscles immediately surrounding it were carried.

AUTUMNAL DIARRHŒA.

(8.) Autumnal Diarrhœa, that plague of infant life in large towns, has lately been added to the list of microphytic diseases. Dr. William Johnston, Assistant Officer of Health for Leicester, where diarrhœa is each year terribly destructive to infant life in the warmer months, concludes,[b] as the result of lengthened investigations, that (*a*) diarrhœa, as it affects both adults and infants during the warm months, owes its origin in a great majority of instances to the introduction of minute living organisms (bacteria of the genera *Micrococcus* and *Bacterium termo*) into the system by means of air or in food (especially milk); and (*b*) the disease depends on putrefactive changes in the bowel contents, which changes are correlative to the development and multiplication of these microscopical organisms.

[a] Vol. LXI., p. 1.

[b] The Causes of Diarrhœa prevalent at Leicester. Sanitary Record, Aug. 15, 1879, p. 43.

II.—The Nature of the Virus in the Contagium Diseases.

With the phenomena presented by the diseases which are accompanied, or may be caused, by the presence of microphytes in the blood, let us now briefly compare those presented by the Contagium Diseases, of which variola or smallpox may be regarded as the paradigm or type.

About fifteen years ago the first systematic attempts were made by Dr. Chauveau, of Lyons, to determine the nature of the contagium or virus of smallpox and of vaccinia. The result of Chauveau's experiments was to prove that the contagia of these diseases were insoluble, for water brought into contact with vaccine lymph or with variolous lymph did not become impregnated with the virus of vaccinia or of smallpox. Dr. Burdon Sanderson has since confirmed Dr. Chauveau's experiments, and thus it has been proved that contagium is *particulate*. It has also been demonstrated that the infective particles are extremely minute, so that they can be readily diffused through a fluid or remain suspended in the air for a considerable time like the tiny motes seen floating in a sunbeam. Again, there is evidence to show that the infective particles are living—a *contagium vivum*—for when placed upon a suitable soil they grow and multiply to an indefinite degree. In vaccine virus the power to transmit the specific disease is lost after exposure to a heat of about 140° F., but it is not injured by intense cold. In a lecture on the "Intimate Nature of Infection and Contagion," delivered before the King and Queen's College of Physicians in 1878, Dr. T. W. Grimshaw, now Registrar-General for Ireland, observes:—"The first attempts to connect the development of fungi with any specific form of zymotic diseases seem to have been by Dr. Cowdell, of Dorchester, who suggested the idea in 1848. In 1849, Drs. Brittan and Swayne, of Bristol, believed that they had discovered vegetable organisms which bore some relation to cholera. I think the first substantial attempt to connect the origin of any specific febrile zymotic with a fungoid growth was made by Dr. Salisbury, of Newark, Ohio, in 1862,[a] who suggested that the origin of camp measles was connected, by the contact of those attacked, with damp straw upon which certain fungi (*puccinia graminis*) had been developed. Following up his inquiry, Dr. Salisbury discovered that he could by inoculation with the spores

[a] The American Journal of the Medical Sciences. July, 1862, and October, 1862.

of those fungi produce a disease very similar to, if not identical with, measles, and which conferred immunity from other attacks of measles. Although Dr. Salisbury has not produced any evidence of the growth of these fungi in the human body, he has given very substantial proof of their power to produce measles; but he has not proved that the contagium of measles is identical with the fungus or its spores produced on damp straw."[a]

As a matter of fact, in measles and scarlatina the contagium has not up to the present been isolated as in smallpox. The minute particles of this last-named disease come under Dr. Billing's definition of "microdemes," but there is no evidence whatever that they can multiply or in any way reproduce themselves outside the living body, or that they can be classed with the schizomycetes or other forms of microphytes. This incapability of reproduction outside the body constitutes one of the characteristics of the contagium diseases, which also as a rule attack an individual but once in his lifetime.

Before I pass on to say a few words as to the bearing of the foregoing doctrines upon the practice of Medicine and Surgery, it is fitting that I should mention one other theory which has been put forward as to the nature of contagium. Dr. Lionel Beale has advanced the view that the contagious particles are composed of *living matter* of animal origin, born in and growing only in the body—they are, in fact, minute portions of what he has termed "germinal matter," "bioplasm," or "protoplasm." He says:[b]—"Living matter or bioplasm constitutes those minute particles known as *disease germs*, which are the agents concerned in propagating all contagious diseases. Having escaped from the infected organism, the particles of contagious bioplasm, often less than the $\frac{1}{100000}$th of an inch in diameter, may be wafted by currents of air, perhaps through very considerable distances. If any of them accidentally come in contact with an organism in a state favourable to their growth and multiplication, they may pass into the blood, grow and multiply, and establish a state of disease like that existing in the organism whence they were derived."

[a] The Action of Vegetable Fungi in the Production of Measles and Allied Diseases. See also Dr. Tilbury Fox in the Journal of Social Science. Vol. I. No. III.

[b] Life Theories: their Influence upon Religious Thought. Page 69. London: J. & A. Churchill. 1871.

III.—The Practical Bearing of the Subject.

In the foregoing observations I have sought to epitomise the present state of our knowledge respecting the organised or vital causes of disease. We have seen that there is good reason to believe that in the septic group of diseases, in relapsing fever, in malaria, in noma, and in some forms of diarrhœa, the presence of microphytes in the blood or other fluids of the body has an intimate causal relation to the phenomena of these several affections—the microphytes either exciting the disease themselves, or playing the part of a ferment which sets agoing the development of the specific poison or virus of the malady. We have seen also that in the contagium diseases the contagium is particulate, incapable of reproduction outside the body, and although not referable to the lower forms of fungi, nevertheless a "contagium vivum," growing and multiplying indefinitely when placed upon a congenial soil.

What, then, is the practical bearing of these researches? The expressions "Preventable Disease" and "Preventive Medicine" have of late years become "familiar as household words," and I cannot help thinking that they are now likely to acquire a fuller and more precise meaning than they have ever possessed in times past. It is true there are some men even at the present day—conscientious, intelligent, and otherwise well-informed men—who object to the use of such a phrase as "Preventable Disease" on the ground that it is—to say the least—irreverent. They point to that close analogy which exists between the moral nature and the physical nature of man, both subject to laws which cannot be broken or violated with impunity. Any infringement of the Divine Moral Law is followed by spiritual disease and death. No less certainly will the violation of the equally Divine Physical Law, subject to which we live and move and have our being, be followed by bodily disease and death. "The soul that sinneth, it shall die!" Ah, yes, but do those who use this argument, so solemnly, so fatally true, forget the glorious antithesis—God is "*not willing* that *any* should perish"? And so I believe that every earnest effort made to *prevent* disease, and the misery it brings in its train, has the Divine sanction and approval.

In striving to attain the prevention of disease, we may hope (1) so to modify the nature of the contagium as to render it inert or comparatively innocuous; (2) to destroy it absolutely either (*a*)

without the body or (β) within the body; (3) so to counteract its effects upon the organism as to save the patient's life or even cause the symptoms quickly to disappear.[a]

(1.) In the case of smallpox alone up to the present time have we been able to modify the contagium in the direction just indicated. Time will not permit me to detail the results of vaccination, and the wonderful influence for good it has exercised in the vast majority of instances.

(2.) We seek to destroy contagium without or within the body by disinfectants or by antiseptics. Nor must we confound these words. The general term "Disinfectant" includes three classes of chemical agents in addition to the physical agents—fresh air and heat:—I. Bodies which remove bad smells, or *deodorants*. II. Substances which check, or wholly prevent, decomposition, or *antiseptics*. III. Bodies which exert a destructive action upon living microdemes and upon dead organic matter, or *true disinfectants*.

"Antiseptic Surgery" is the term applied to two apparently diverse methods of prevention of blood-poisoning during and after surgical operations. The first is the well-known method of Lister, with its many modifications. It aims at totally preventing the contact of living microphytes with an injured surface. The second is the "air-dressing," which aims at the freest possible exposure, in order that all dead and septic matters may easily and rapidly escape. Both these methods have given excellent results, and—as Dr. Billings[b] well observes—"so long as only the ordinary microdemes of all air and water are present, the difference between the results obtained by these apparently opposite methods is not great; but so soon as the element of specific contagium comes in, the only hope of safety lies in the absolute exclusion."

(3.) As an illustration of a drug counteracting the effects of a microphytic disease upon the system, I may refer to the action of quinine in malaria.

"The quinine, when swallowed, will be absorbed like the spores themselves, and, by preventing their multiplication or actually destroying them, will tend to prevent their getting into the general circulation, and there doing mischief. We can understand also the action of quinine as a prophylactic, because, if steadily taken, the spores, when swallowed, will find themselves in a fluid unfavourable

[a] *Cf.* Grimshaw. Loc. cit.
[b] Loc. cit. P. 25.

to their growth, and thus be prevented from multiplying at all. But quinine sometimes does not act, or does not act at all well, unless its action be aided by the use of an emetic or purgative. These remove from the body a quantity of bile, and with it they will probably remove a number of malarious spores, and the multiplication of those which are left may be controlled by means of quinine, although previous to the removal of the bile the quantity of spores contained in the portal circulation was too great to be kept completely under by the quinine. In places where quinine is unknown, or not readily obtained—as in Morocco—ague is cured by the use of emetics and purgatives alone."[a]

Did time permit, we could easily multiply examples of the practical utility of the inquiry into the etiology of disease; but those which have been given must suffice at present. The knowledge we possess is small, and, as an author, whom I have already had frequent occasion to quote in this address, remarks, "our hope of substantial scientific progress in knowledge of the causes of disease rests mainly on two methods as yet little used—namely, on the *registration of disease* and on *comparative experimental pathology*."

Gentlemen, I would wish to conclude this notice of the "Microcosm of Disease," and of the lessons it teaches, by quoting a short passage from a discourse delivered some years ago, in the Theatre of the Royal Dublin Society, by a physician who was well known in this hospital, and indeed throughout the civilised world. The author to whom I allude remarks:[b]—

"Till the germ theory of contagion is established, till we know more of germ life, and of what preserves, what destroys it, and what replaces the latent by the manifest life, I believe that we must mainly trust to disinfection, to cleanliness in the *widest* acceptation of the word.

"It may yet happen—and God forbid that its possibility should be denied—that science will discover the essence of these affections, and, with that, the means of preventing and extinguishing them. When that is accomplished, Preventive Medicine will be employed directly, as it is now indirectly. Till that time comes, however, there is a great work for us to do. We have, on the one hand, to

[a] The Practitioner. August, 1879. Page 118.

[b] On Sanitary Science in Ireland. By William Stokes, M.D., D.C.L., F.R.S. Dublin: Hodges, Foster, & Co. 1874.

labour patiently, and in a severely inductive spirit, in the study of the natural history of epidemics, and their comparison in various portions of the world, avoiding conjecture, and honestly accumulating and analysing facts, which, thus treated, will in time crystallise into discovery."

The writer of these weighty, almost prophetic, words was WILLIAM STOKES—a name amongst the most illustrious in the heraldry of this hospital, in which, as physician, during well-nigh half a century, he acquired a wonderful experience of the natural history of disease. Far in advance of his contemporaries, his mind with eagle glance gazed into the future, foreseeing a time when modern methods of research would pour a flood of light upon the causes, and, as a consequence, upon the preventive treatment of disease. He lived only to reach the borders of that Promised Land, for even of earth's best and greatest the words are true—

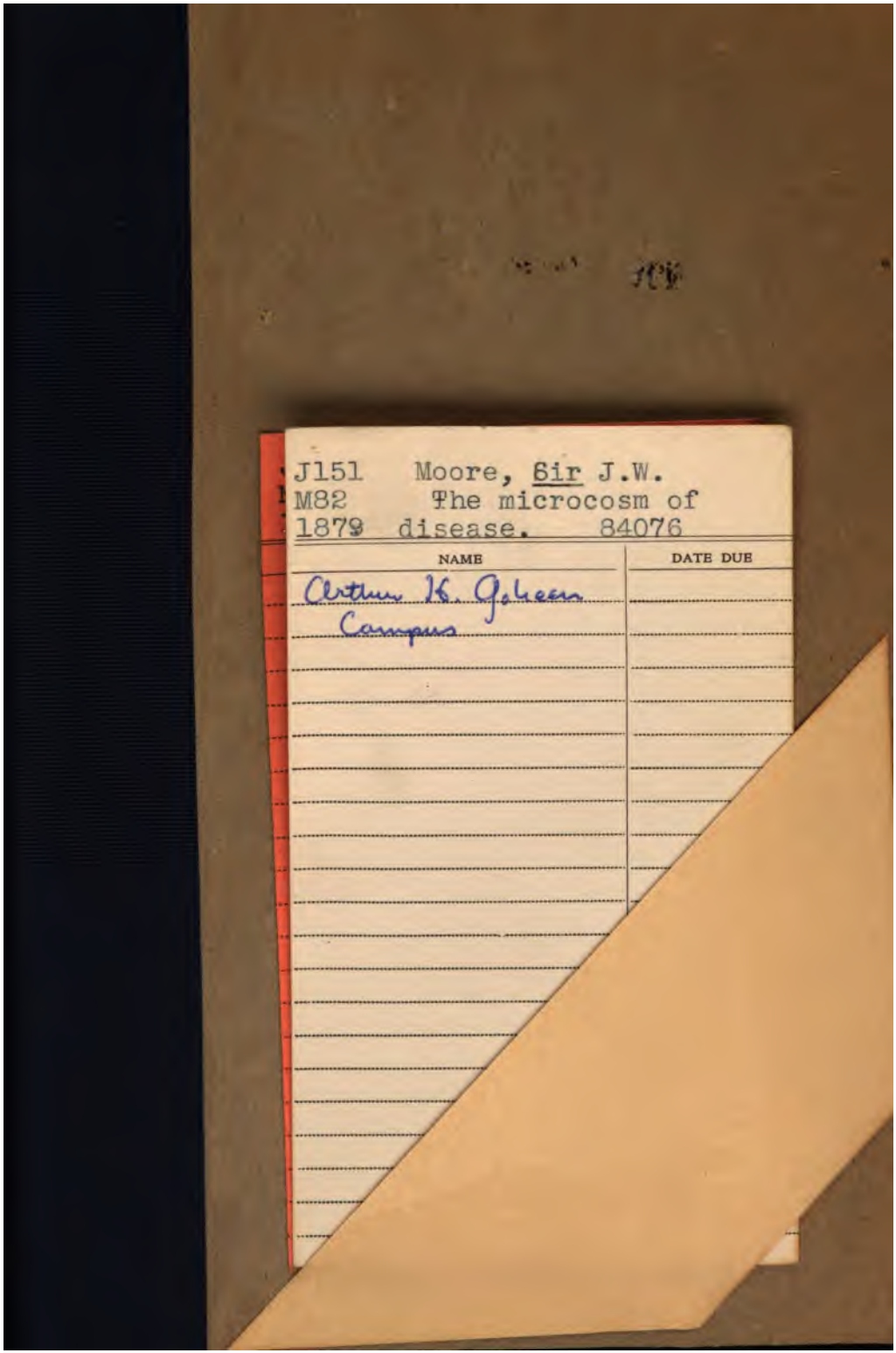
> "All that lives must die,
> Passing through Nature to Eternity."

So he, too, passed away—to use the words in which he himself spoke of another—"after a long and splendid life of deserved and almost unexampled success, with 'honour, love, obedience, troops of friends.'"

LANE MEDICAL LIBRARY

This book should be returned on or before the date last stamped below.

NOV 6 1959


J151 Moore, Sir J.W.
M82 The microcosm of
1879 disease. 84076
NAME
DATE DUE
Arthur K. Johnson
Campus